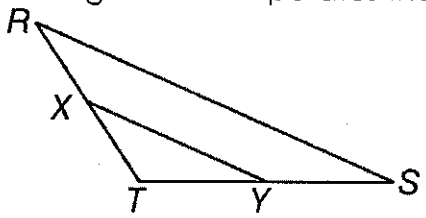
Geometry
Proportion Parts and Midsegments of Triangles

Name:_____
Date: _____

Proportional Parts of Triangles (AKA "Triangle Side-Splitter Theorem"

- In any triangle, if a line is **parallel** to one side of a triangle then it separates the other two sides **proportionally.**



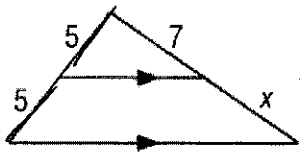
- Converse is also true:
  - In any triangle, if the sides are cut **proportionally**, then the line is **parallel** to one side of the triangle.

If $\overleftrightarrow{XY} \parallel \overleftrightarrow{RS}$, then $\frac{RX}{XT} = \frac{SY}{YT}$. If $\frac{RX}{XT} = \frac{SY}{YT}$, then $\overleftrightarrow{XY} \parallel \overleftrightarrow{RS}$.

$\frac{Part}{Part} = \frac{Part}{Part}$ OR $\frac{Part}{Whole} = \frac{Part}{Whole}$

Practice:

1.

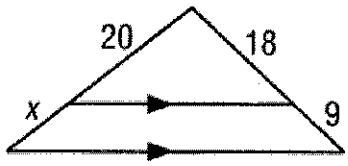


$\frac{5}{5} = \frac{7}{x}$

$\frac{5x}{5} = \frac{35}{5}$

$x = 7$

2.

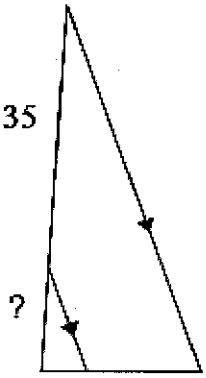


$\frac{20}{x} = \frac{18}{9}$

$\frac{18x}{18} = \frac{180}{18}$

$x = 10$

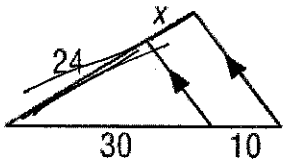
3



$\frac{35}{x} = \frac{15}{6} \rightarrow \frac{15x}{15} = \frac{210}{15}$

$x = 14$

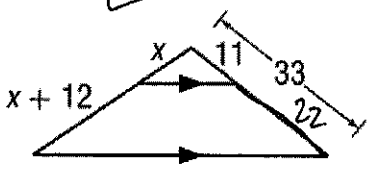
5.



$\frac{24}{x} \times \frac{30}{10}$

$\frac{30x}{30} = \frac{240}{30}$

$x = 8$



$\frac{x}{x+12} = \frac{11}{22}$

$22x = 11(x+12)$

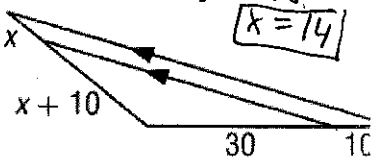
$22x = 11x + 132$

$-11x \quad -11x$

$11x = 132$

$x = 12$

6.



$\frac{x+10}{x} = \frac{30}{10}$

$10(x+10) = 30x$

$10x + 100 = 30x$

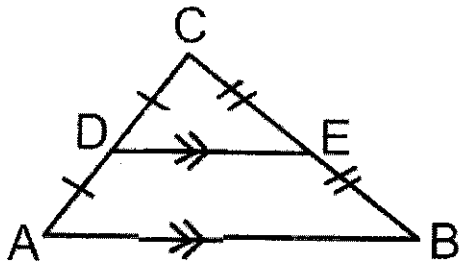
$-10x \quad -10x$

$\frac{100}{20} = \frac{20x}{20}$

$5 = x$

Midsegment of a Triangle

A **midsegment** of a triangle is a segment joining the midpoints of the two sides of a triangle. In other words, it cuts each side it touches into two congruent segments. The mid-segment runs parallel to its "base"



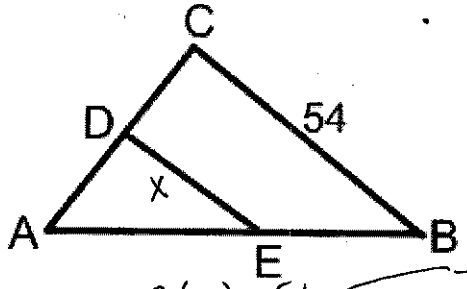
DE is a midsegment of ΔABC.

- $\overline{AD} \cong \overline{DC}$
- $\overline{BE} \cong \overline{EC}$
- $\overline{DE} \| \overline{AB}$
- $2 \cdot \overline{DE} = \overline{AB}$

***********"Two times the mid-segment equals the base"**********

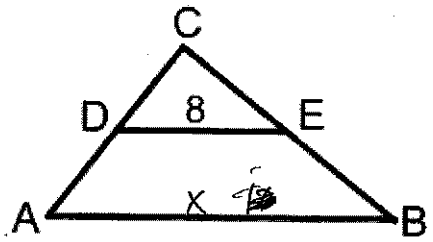
Examples

1. Given DE is the length of the midsegment. What is its length?



$\frac{2(x)}{2} = \frac{54}{2}$ $x = 27$

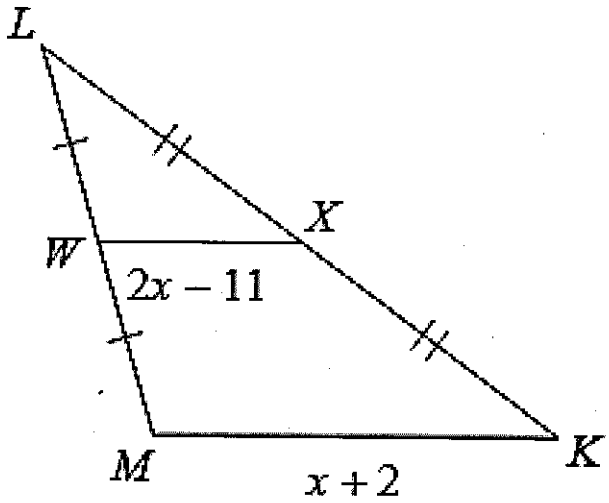
2. Given DE is the length of the midsegment. Find AB.



$2 \cdot 8 = x$

$16 = x$

3. Solve for x:



$2(2x-11) = x+2$

$4x - 22 = x + 2$

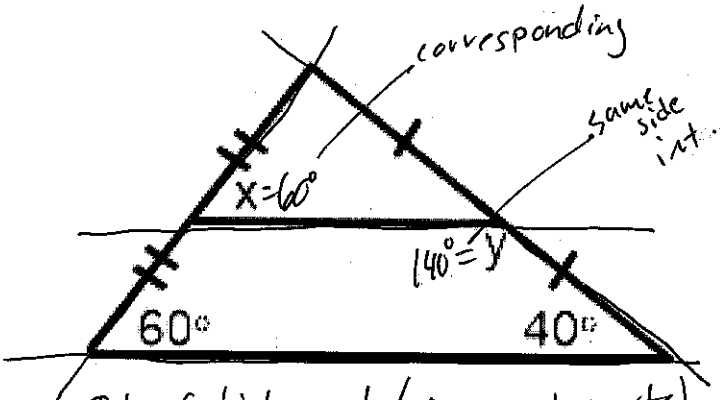
$+22 \quad +22$

$4x = x + 24$

$-x \quad -x$

$\frac{3x}{3} = \frac{24}{3}$ $(x = 8)$

4. Solve for x and y (angles)



B/c of tick marks (congruent parts) we know this Δ has mid segment, and mid-segment is parallel to base ∴.